

# Physicians as Food-Safety Educators: A Practices and Perceptions Survey

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An estimated 4 million bacterial foodborne illnesses occur in the United States annually. Many of these illnesses can be prevented by educating the public about food-safety practices. We investigated both the role of physicians as food-safety educators and the barriers to providing food-safety information. Participants were randomly selected physicians ( $n = 3117$ ) practicing within the surveillance area of the Foodborne Diseases Active Surveillance Network; 1100 were included in the study. Although only 331 (30%) of 1110 respondents provided food-safety information to their patients, 524 (68%) of 769 who did not provide information expressed interest in doing so. Physicians were more likely to provide food-safety information to patients if they perceived foodborne disease to be a serious problem, perceived food-safety education as their role, felt that patients perceived them as a valuable resource for food-safety advice, or felt comfortable making food-safety recommendations. A national physician education campaign that addresses barriers in food-safety education could improve food-safety education by physicians.

An estimated 4 million bacterial foodborne illnesses occur annually in the United States [1]. To reduce the burden of foodborne diseases, interventions are necessary throughout the “food-safety continuum” from farm to table. Individual food-safety behaviors that may prevent foodborne diseases include the proper choice, cleaning, cooking, and storage of foods.

People at greater risk of severe forms of foodborne

disease include those whose normal host defenses have been impaired by illness, medical treatment, or as a result of age. High-risk populations include HIV-infected persons [2], organ transplant recipients, elderly persons, pregnant women, and infants. Food-safety education materials, including information on safe food handling and eating practices, have recently been created by the American Medical Association (AMA), the Centers for Disease Control and Prevention (CDC), the US Food and Drug Administration (FDA), and the US Department of Agriculture (USDA) to educate consumers, especially those at greatest risk, on the prevention of foodborne disease. These materials, entitled *Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians*, can be accessed at the following Web site: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5002a1.htm> [3].

In the United States, physicians are the most trusted source of health information for the general public [4].

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To assess the role of physicians as food-safety educators for high-risk patients, the Emerging Infections Program's Food-borne Diseases Active Surveillance Network (FoodNet) conducted a perceptions and practices survey of physicians specializing in infectious diseases, oncology, nephrology, and obstetrics/gynecology.

## METHODS

FoodNet surveillance areas (also known as "FoodNet sites") in 8 states, including all counties in Connecticut, Georgia, Minnesota, and Oregon and selected counties in California (Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma), Maryland (Anne Arundel, Baltimore, Baltimore City, Carroll, Harford, and Howard), New York (Albany, Columbia, Genesee, Greene, Livingston, Monroe, Montgomery, Ontario, Orleans, Rensselaer, Saratoga, Schenectady, Schoharie, Wayne, and Yates), and Tennessee (Cheatham, Davidson, Dickson, Hamilton, Knox, Robertson, Rutherford, Shelby, Sumner, Williamson, and Wilson) participated in the study. The target population for the survey was physicians practicing at least 8 h/week in the FoodNet sites in 1 of 4 specialties: infectious diseases, nephrology, obstetrics/gynecology, or oncology; physicians working in these specialties were thought to be more likely to serve patients who are at greater risk of severe forms of foodborne disease.

Survey participants were randomly selected by specialty (infectious diseases, nephrology, obstetrics/gynecology, or oncology) using state licensing offices or commercially purchased physician address lists. A self-administered, 30-question, mail-in questionnaire was developed by the FoodNet study team. Questions on the survey were categorized into "general information" (e.g., specialty, number of years in practice, and type of clinical setting), "information distribution" (e.g., types of food-safety information distributed to patients, who distributes information, when information is provided, and the desire to distribute food-safety information to patients), and "perceptions" (e.g., perceived role as a food-safety educator). Questions were both open-ended and closed-ended; the "perceptions" section measured participants' levels of agreement or disagreement to statements by means of a 5-point Likert scale. The study was approved by the CDC Institutional Review Board (IRB) and individual site IRBs. We conducted the study in accordance with guidelines for human research as specified by the US Department of Health and Human Services.

Historically, there have been low response rates for mail-in surveys involving physicians as study populations [5]; therefore, a response rate of 33%–40% was expected. It was estimated that each of the 8 FoodNet sites had sufficient resources to efficiently manage ~100 respondents; thus, anticipating a 33% response rate, each of the 8 FoodNet sites randomly selected

300 physicians to receive the survey. Sites attempted to select 75 participants in each of the 4 specialties for the study. If <75 physicians practiced in a given specialty, all physicians within that specialty were selected, and additional physicians from the remaining specialties were randomly selected until the survey population per site totaled at least 300.

Questionnaires were mailed to the study participants, along with a cover letter, a confidentiality statement, an addressed and stamped return envelope, and an option to request food-safety education materials. If a physician did not respond within 1 month, he or she was mailed a follow-up letter and another copy of the questionnaire. If a survey was returned because of an incorrect address, another physician was randomly selected from the surplus pool and sent a questionnaire. Physicians who requested food-safety information were sent the physician primer developed by the AMA, CDC, FDA, and USDA [3].

Data entry was completed with Epi Info, version DOS 6.04c (CDC, Atlanta, GA) by the participating FoodNet sites. Subsequently, the CDC created an aggregate data set of participants' responses from all 8 FoodNet sites. All subsequent analyses were conducted using SAS, version 6.12 (SAS). "Don't know" and "not sure" responses were excluded from the analysis.

Descriptive data analysis was completed on all survey questions. Univariate ( $\chi^2$ ) analyses were conducted to identify significant perception-based predictors for the provision of food-safety information by physicians. Backward logistic regression was completed to identify the best-fit model; "provision of food-safety information by a physician" was used as the response (dependent) variable, and 13 perception-based questions were used as predictor variables. For the univariate and multivariate analyses, perception responses (originally on a 5-point Likert scale) were dichotomized to the variables "agree" or "disagree." It was unknown whether respondents answered "neutral" because of a true neutral perception or a preference to not provide an "agree" or "disagree" response; as such, neutral responses were not included in the univariate analysis. Corrected risk ratios with  $P < .05$  were considered to be significant.

## RESULTS

**Response rate and study population.** Between 21 September 2000 and 2 April 2001, surveys were sent to 3290 randomly selected physicians in 8 FoodNet sites. Of these, 173 were returned because incorrect addresses; 3117 (95%) surveys apparently reached a correct address. Of these, 1347 (43%) physicians returned a completed survey and 1100 met the study's criteria for analysis; 247 respondents reported practicing <8 h/week, and their data were not included.

Respondents included obstetricians and gynecologists (43% of respondents), oncologists (19%), infectious diseases specialists (16%), nephrologists (16%), and physicians with other

specialties (6%) from a variety of clinical settings, including private outpatient clinics (62%), health care maintenance organization outpatient clinics (6%), hospitals (28%), and other types of practice (5%) (table 1). The median number of years participating physicians had practiced was 15 (range, 1–52 years).

**Food-safety education practices.** Two hundred and seventy-six (25%) of 1100 physicians in our study reported that food-safety information was requested at least occasionally by patients. Three hundred thirty-one physicians (30%) reported working in practices that provided food-safety information to patients. Of the 769 respondents who worked in practices that did not provide food-safety information, 524 (68%) reported that they would like to provide such information to their patients. Clinics that provided food-safety information used physicians (reported by 90% of respondents), nurses (61%), dietitians (32%), and other personnel (13%) to communicate food-safety information to patients.

A variety of methods was used to disseminate food-safety information, including brief discussions (reported by 87% of respondents), brochures (38%), extended discussions (23%), posters (4%), videos (2%), and other methods (3%). Topics of food-safety information provided included summaries of “risky” foods (reported by 89% of respondents), safe food-handling procedures (62%), pregnant women and foodborne disease (44%), HIV-infected persons and foodborne disease (36%), salmonellosis (35%), listeriosis (28%), cryptosporidiosis (24%), other high-risk populations and foodborne disease (22%), other foodborne diseases (17%), and other topics (6%). Physicians reported giving food-safety information to patients when they requested information (65% of respondents), at initial patient visits (41%), when patients were diagnosed with a foodborne illness (37%), and during routine office visits (35%).

**Physicians’ perceptions as food-safety educators.** Most responding physicians agreed that they wanted to be aware of the risks of foodborne illness in their patients (94% of respondents), that foodborne disease is a serious problem in immunocompromised patients (92%), that the provision of food-safety information is part of the physician’s role (85%), and that their patients are at risk for foodborne diseases (70%) (table 2). Additionally, most physicians were willing to provide a brief talk to their patients about preventing foodborne illness (69% of respondents) and believed that educating patients about food safety would result in a decrease in foodborne illness (86%).

**Provision of food-safety information: univariate analysis.** With one exception, agreement with each perception statement was associated with an increased likelihood that responding physicians provided food-safety information to their patients (table 3). The only exception was the statement “effectively educating patients on how to prevent foodborne illness takes

**Table 1. General demographic characteristics of physicians who responded to the food-safety education questionnaire, Foodborne Diseases Active Surveillance Network (FoodNet), August 2001.**

Variable	No. (%)
State	1100 (100)
California	106 (9.6)
Connecticut	132 (12.0)
Georgia	91 (8.3)
Maryland	214 (19.5)
Minnesota	122 (11.1)
New York	123 (11.2)
Oregon	140 (12.7)
Tennessee	172 (15.6)
Specialty	1098 (100)
Obstetrics/gynecology	477 (43.4)
Oncology	209 (19.0)
Infectious diseases	178 (16.2)
Nephrology	176 (16.0)
Subspecialty of internal medicine <sup>a</sup>	18 (1.6)
Other <sup>a</sup>	40 (3.6)
Primary clinical setting	1095 (100)
Outpatient, private	673 (61.5)
Outpatient, HMO	68 (6.2)
Hospital-based	302 (27.6)
Other	52 (4.7)
Intern, resident, or fellow	1097 (100)
Yes	30 (2.7)
No	1067 (97.3)
Average no. of patients seen per week	1001 (100)
1–10	32 (2.9)
11–25	142 (13.0)
26–50	255 (23.4)
51–75	276 (25.3)
>75	381 (34.9)
Not sure	5 (0.5)
Percentage of patients immunocompromised or pregnant	1096 (100)
0	57 (5.2)
1–25	398 (36.3)
26–50	341 (31.1)
51–75	178 (16.2)
76–100	117 (10.7)
Not sure	5 (0.5)

**NOTE.** HMO, health maintenance organization.

<sup>a</sup> Include gynecologic oncology, HIV medicine, internal medicine, maternal-fetal medicine, neuro-oncology, pediatrics (hematology, oncology, or infectious diseases), radiology, reproductive endocrinology, urology, and women’s health.

too much time”; agreement with this statement was associated with a decreased likelihood of providing food-safety information to patients.

**Provision of food-safety information: multivariate analysis.** In multivariate analysis, only 4 perception-based variables remained statistically significant predictors of physicians’ provision of food-safety information to their patients. Physicians

**Table 2. Perceptions of responding physicians regarding their role as food-safety educators, Foodborne Diseases Active Surveillance Network (FoodNet), August 2001.**

Statement of perception	No. (%) of respondents, by answer (n = 1100)				
	Neutral or no answer	Strongly agree	Agree	Disagree	Strongly disagree
Foodborne disease is a serious problem in immunocompromised patients	153	473 (50)	394 (42)	46 (5)	34 (4)
Many of my patients are at risk for foodborne diseases	315	189 (24)	363 (46)	153 (20)	80 (10)
Assuring that patients receive education about prevention of foodborne illness is part of the physician's role	409	172 (25)	413 (60)	87 (13)	19 (3)
I want to be aware of the risks of foodborne illness in my patients	177	365 (40)	495 (54)	47 (5)	16 (2)
My patients would be interested in learning how they can prevent foodborne diseases	329	208 (27)	462 (60)	84 (11)	17 (2)
I am willing to provide a brief (3-min) talk to my patients on preventing foodborne illness	332	172 (22)	364 (47)	149 (19)	83 (11)
Educating patients about food safety will result in a decrease in foodborne illness	305	242 (30)	447 (56)	88 (11)	18 (2)
My patients are likely to comply with recommendations I provide on prevention of foodborne illness	424	100 (15)	439 (65)	117 (17)	20 (3)
Effectively educating patients on how to prevent foodborne illness takes too much time	486	66 (11)	225 (37)	273 (45)	50 (8)
I am comfortable with my general knowledge of foodborne illness	708	97 (14)	289 (41)	279 (39)	43 (6)
I am confident about diagnosing and treating foodborne illness in my patients	387	112 (16)	275 (39)	273 (38)	53 (7)
I am comfortable making recommendations on how to prevent foodborne illness	384	115 (16)	360 (50)	206 (29)	35 (5)
My patients feel that I am a valuable resource for advice on prevention of foodborne diseases	502	95 (16)	240 (40)	197 (33)	66 (11)

**NOTE.** The total no. of responses does not include neutral responses.

were more likely to provide food-safety information to their patients if the physicians agreed with  $\geq 1$  of the following statements: (1) "foodborne illness can be a serious problem in immunocompromised patients" (risk ratio [RR], 1.9;  $P = .004$ ), (2) "assuring patients receive education about the prevention of foodborne illness is part of the physician's role" (RR, 1.9;  $P = .001$ ), (3) "I am comfortable providing food safety recommendations to my patients" (RR, 1.8;  $P = .002$ ), and (4) "I am a valuable resource for advice on the prevention of foodborne diseases" (RR, 2.0;  $P = .001$ ).

## DISCUSSION

In our study, only 331 (30%) of 1110 responding physicians worked in clinics that provided food-safety information to their patients; 299 (90%) of these physicians provided the information themselves. Of the 769 physicians who worked in practices that did not provide food-safety information, 524 (68%) reported that they would like to provide such information to their patients.

Physicians were less likely to provide food-safety information if they did not perceive foodborne disease to be a serious prob-

lem in immunocompromised patients, did not perceive food-safety education to be the physicians' role, felt that patients did not perceive them as a valuable resource for food-safety advice, or felt uncomfortable making recommendations on how to prevent foodborne illness. It is somewhat surprising that time was not perceived by physicians to be a barrier to educating patients about foodborne disease prevention.

Behavioral science theories support our study's purpose and outcomes. According to the health belief model used in nutritional studies [6], there are 4 primary perceptions that influence health behaviors (in our case, the behavior of interest is the physician's provision of food-safety information to at-risk patients). Predictors for engaging in healthy behaviors include perceived susceptibility, perceived severity, perceived barriers, and perceived benefits. We wanted to determine whether physicians perceived their patients to be at risk of foodborne disease (perceived susceptibility), whether physicians thought foodborne disease was a serious problem for their patients (perceived severity), whether physicians thought it would take too much time to provide information (perceived barriers), and whether physicians thought patients saw them as valuable resources for food-safety advice (perceived benefits). Additionally,

**Table 3. Association between statements of perception and provision of food-safety information among responding physicians, Foodborne Diseases Active Surveillance Network (FoodNet), August 2001.**

Statement of perception	Proportion (%) of respondents who agree with statement		
	Who provides information	Who does not provide information	RR (95% CI)
Foodborne disease is a serious problem in immunocompromised patients	268/297 (90.2)	599/788 (76.0)	2.0 (2.0–4.4)
Many of my patients are at risk of foodborne diseases	181/297 (60.9)	371/788 (47.1)	1.8 (1.3–2.3)
Assuring that patients receive education about prevention of foodborne illness is part of the physician's role	214/296 (72.3)	371/786 (47.2)	2.9 (2.2–3.9)
I want to be aware of the risks of foodborne illness in my patients	269/296 (90.9)	591/789 (74.9)	3.3 (2.2–5.0)
My patients would be interested in learning how they can prevent foodborne diseases	227/295 (77.0)	443/789 (56.2)	2.6 (1.9–3.5)
I am willing to provide a brief (3-min) talk to my patients on preventing foodborne illness	191/297 (64.3)	345/786 (43.9)	2.3 (1.8–3.0)
Educating patients about food safety will result in a decrease in foodborne illness	210/298 (70.5)	479/783 (61.2)	1.5 (1.1–2.0)
My patients are likely to comply with recommendations I provide on prevention of foodborne illness	177/297 (59.6)	362/785 (46.1)	1.7 (1.3–2.3)
Effectively educating patients on how to prevent foodborne illness takes too much time <sup>a</sup>	71/294 (24.1)	220/778 (28.3)	0.8 (0.6–1.1)
I am comfortable with my general knowledge of foodborne illness	144/297 (48.5)	242/784 (30.9)	2.1 (1.6–2.8)
I am confident about diagnosing and treating foodborne illness in my patients	141/298 (47.3)	246/786 (31.3)	2.0 (1.5–2.6)
I am comfortable making recommendations on how to prevent foodborne illness	185/295 (62.7)	290/785 (36.9)	2.2 (2.2–3.8)
My patients feel that I am a valuable resource for advice on prevention of foodborne diseases	149/296 (50.3)	186/773 (24.1)	2.4 (2.4–4.2)

**NOTE.** Proportions are no. of respondents who agree with the statement/no. in the group who responded to the question. RR, risk ratio.

<sup>a</sup> Not statistically significant ( $P > .05$ ); all other associations are significant ( $P < .05$ ).

a construct called “self-efficacy” was used. In brief, self-efficacy is a person's perceived ability to complete a given health behavior. For our study, self-efficacy was equivalent to a physician's perceived ability to comfortably and effectively provide food-safety advice to their patients.

Following these constructs from the health belief model, we identified the strongest predictors of physicians' provision of food-safety information to their patients. Food-safety campaigns can be developed that target our significant predictors—namely, campaigns to help physicians perceive themselves as food-safety educators, to increase physicians' awareness of their value to patients as food-safety educators, and to increase their comfort in providing food-safety information to at-risk patients.

Although no peer-reviewed literature was found regarding physicians' provision of food-safety information to high-risk patients, health behavior studies have explored reasons why few physicians serve as dietary and nutrition advisors. In one study, the perceived absence of risk in patients was the primary reason for physicians not providing nutritional advice [7]. Other important barriers preventing physicians from educating patients about their diets have included a perceived lack of patient interest in dietary changes, expectation of patient nonadherence

to recommendations, lack of knowledge about nutrition, lack of time, perceived lack of influence on patients, no interest in the effects of diet on health, and perceived lack of ability to advise on, treat and prevent nutrition-related diseases [7–9].

Physicians are important food-safety educators for the following reasons: (1) physicians have contact with ~80% of the population during a given year [10], (2) people are most likely to change their behavior if they have recently experienced an illness or see themselves as being at risk [11], (3) people value physicians over other experts (such as dietitians) as key sources of health information [8, 9], and (4) education programs involving 1–3-min discussions between physicians and patients can be as effective as 30-min counseling sessions by other experts [12]. Thus, a food-safety education campaign for physicians who serve high-risk patients is warranted.

Our study has several limitations. Because of the traditionally low response rates of mail-in surveys for physicians, the results cannot be generalized to all physicians serving high-risk patients. In a study by Kaner et al. [5], a general increase in physicians' workloads is a primary factor for the recent declining response rates to mail-in surveys. This increase in workload could have biased our survey responses (e.g., physicians who felt they did not have time to provide food-safety infor-

mation to patients may not have had time to fill out the survey). However, our study population was relatively large ( $n = 1100$ ). The study population did not accurately represent the true distribution of the 4 specialties in FoodNet sites. We did weigh selected descriptive data to evaluate a potential bias due to our sample population; most of our selected weighted response percentages were the same as or similar to (within 2%) the nonweighted response percentages. The survey was limited to self-reported data; we could not observe or confirm the actual provision of food-safety information to patients by physicians. "Likeability" by respondents was not measured; therefore, it was not possible to assess whether physicians provided their actual perceptions or what they thought were the "right" answers. Finally, because all specialties of medicine that serve at-risk populations (e.g., pediatrics) were not included in the study, our results are not generalizable to all at-risk populations, including children.

The high incidence of foodborne diseases in the United States [1] and the severity of these diseases in at-risk populations make consumer education about food-safety practices an important part of prevention. Physicians serving at-risk patients are in an important position to serve as food-safety educators. The general food-safety education materials that were recently developed were distributed to physicians after the survey was conducted. Further education efforts based on these and other materials are warranted. A targeted food-safety education campaign for physicians serving patients at the highest risk for severe forms of foodborne disease could enhance physician-based education. The results of our survey indicate that such a campaign should focus on emphasizing which patients are at the highest risk for severe sequelae of foodborne disease, increasing physicians' perceived roles as food-safety educators, validating physicians' values as food-safety educators for their patients, and increasing their comfort in providing food-safety information to their patients.

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